Chapter 12

Maintain and Replace the FPCs and PICs

This chapter discusses the following topics related to maintaining and replacing the FPCs and PICs in the router:

Tools and Parts Required

To maintain and replace the FPCs and PICs, you need the following tools and parts:

- Phillips (+) screwdrivers, numbers 1 and 2
- Electrostatic bags, one for each component removed
- Antistatic mat
- ESD grounding wrist strap
- Replacement component or blank panel for each component removed
- Rubber safety cap for each port on each fiber-optic PIC removed

Maintain the FPCs and PICs

To maintain the FPCs and PICs, follow these guidelines:

- To observe the status of the FPCs, check the FPC LEDs and the LCD display on the craft interface. For more information, see “Craft Interface” on page 20.
- To display status information about installed FPCs and PICs, use the CLI command:

```
user@host> show chassis fpc
```

To display more detailed information, use the option:

```
user@host> show chassis fpc detail
```

To observe the status of the PICs, check the PIC status LEDs. Each PIC has one LED located on the PIC faceplate. For more information, see “Physical Interface Cards (PICs)” on page 13.

For more information about using the CLI, see the JUNOS Internet software manuals.

Replace an FPC

The FPCs are hot-insertable and hot-removable. When you remove an FPC, the router continues to function, although the PIC interfaces installed on the FPC being removed no longer function. To replace an FPC, use the following procedures:

Remove an FPC on page 162

Install a Replacement FPC on page 165

Verify That the FPC Is Installed Correctly on page 168

Do not operate the router with any of the FPC slots empty. When you remove an FPC, immediately install a replacement FPC or FPC blank panel to prevent overheating of router components.

Remove an FPC

The router holds up to eight FPCs, which are installed vertically in the front of the router. An empty FPC3 weighs 14.8 lb (6.7 kg), an empty FPC2 weighs 14.3 lb (6.5 kg), and an empty FPC1 weighs 14.3 lb (6.5 kg).

To remove an FPC, follow this procedure (see Figure 73):

1. Have ready a replacement FPC or FPC blank panel, and an antistatic mat for the FPC. Also have ready rubber safety caps for each PIC using an optical interface on the FPC that you are removing.

2. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.

3. As you face the front of the chassis, locate the two LEDs and the online/offline button directly above the FPC that you are removing.

4. Take the FPC offline by pressing its online/offline button. Press and hold the button until the LED goes out (about 5 seconds).

5. Label the cables connected to each PIC on the FPC so that you can later reconnect each cable to the correct PIC.

Do not look directly into the PIC cable connectors or into the ends of optical fiber cables. PICs that use SONET or ATM single-mode optical fiber contain laser light sources that can damage your eyes.

6. Remove the cable connectors plugged into each PIC on the FPC and immediately place a rubber safety cap over each connector.

7. Carefully drape each disconnected cable over the bobbins on the cable management system below the FPC card cage to prevent the cables from developing stress points.

Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

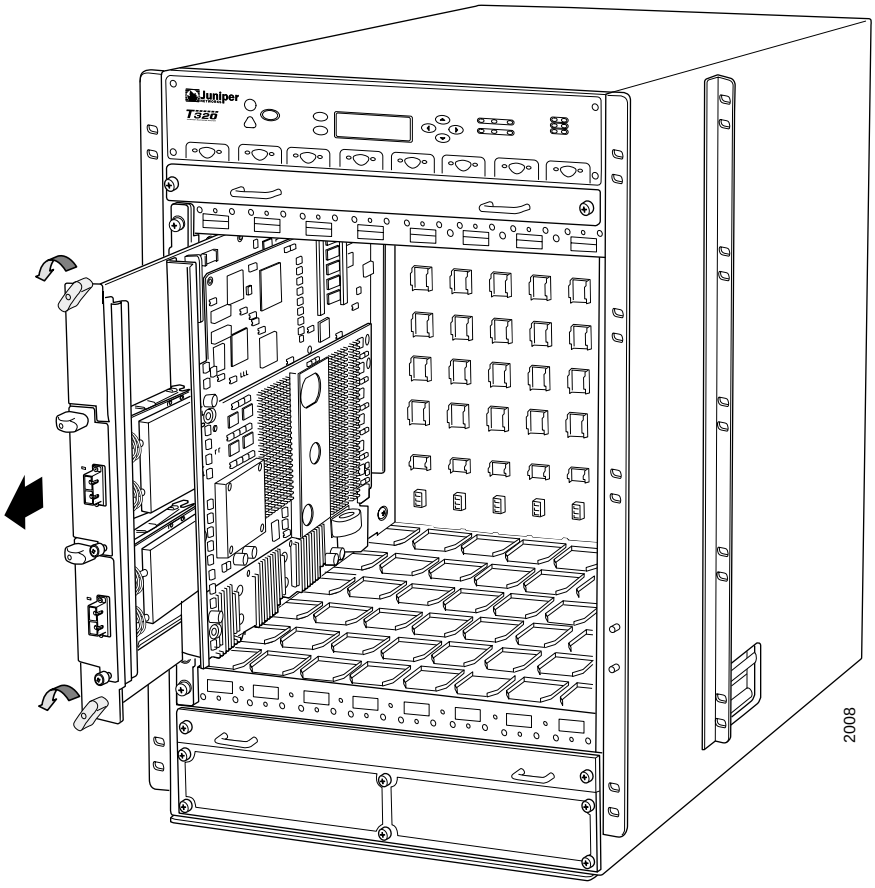
8. Loosen the screws inside the ejector handles at the top and bottom of the FPC faceplate.

9. Simultaneously turn both the ejector handles counterclockwise to unseat the FPC.

10. Slide the FPC straight out of the card cage part of the way, grasping it by the ejector handles.

Do not stack FPCs after you remove them.

Figure 73: Remove an FPC



11. Hold the bottom of the FPC to support its weight.

> **Caution** An FPC weighs at minimum 14.3 lb (6.5 kg) and can weigh as much as 19 lb (8.6 kg), depending on configuration. Be prepared to support the full weight of the FPC as you remove it from the router.

12. Slide the FPC all the way out of the chassis.

13. Place the removed FPC on an antistatic mat.

14. If necessary, remove each installed PIC from the FPC. For information on removing a PIC, see “Remove a PIC” on page 168.

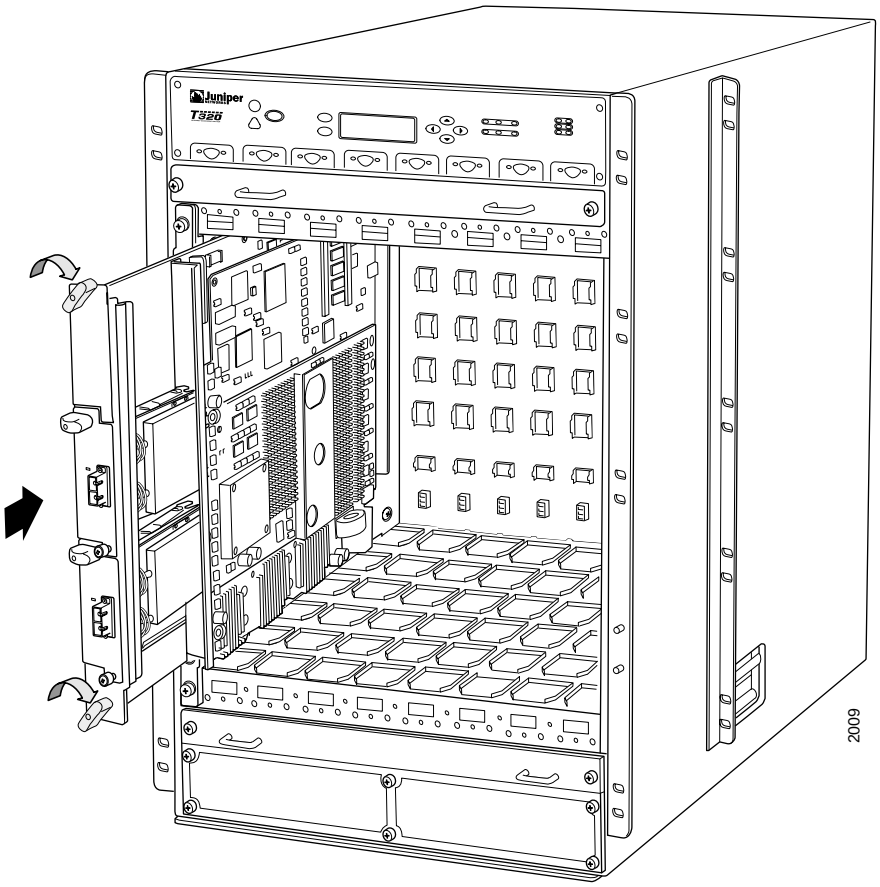
15. After you remove each PIC, immediately place it on an antistatic mat or in an electrostatic bag.

Install a Replacement FPC

To install a replacement FPC, follow this procedure (see Figure 74):

1. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.
2. Place the replacement FPC on an antistatic mat.
3. Take each PIC to be installed in the replacement FPC out of its electrostatic bag and identify the slot on the FPC where it will be connected.
4. Verify that each fiber-optic PIC has a rubber safety cap covering the PIC transceiver. If it does not, cover the transceiver with a safety cap.
5. Install each PIC into the appropriate slot on the FPC. For information on installing a PIC, see “Install a Replacement PIC” on page 170.
6. Locate the slot in the FPC card cage in which you plan to install the FPC.
7. Lift the FPC into place and carefully align first the bottom, then the top of the FPC with the guides inside the card cage. Be sure the FPC is right-side up, with the components on the right of the FPC.
8. Slide the FPC all the way into the card cage until you feel resistance.
9. Starting with the ejector handles on the FPC faceplate in a position close to horizontal, simultaneously turn both ejector handles clockwise to seat the FPC.
10. Tighten the screws inside the ejector handles to secure the FPC. Do not overtighten them.

Figure 74: Install a Replacement FPC

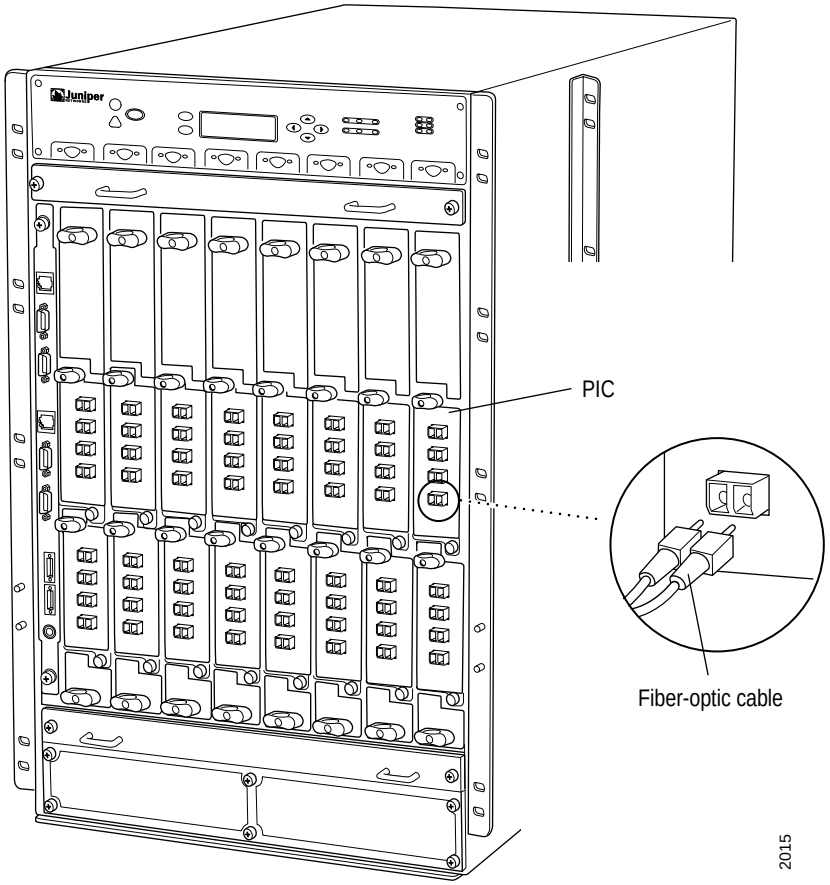


11. Remove the rubber safety cap from each fiber-optic PIC transceiver.

> **Warning** Do not look directly into the PIC transceivers on into the ends of the optical fiber cable. PICs that use SONET or ATM single-mode optical fiber contain laser light sources that can damage your eyes.

12. Connect the appropriate cable to the PIC transceiver (see Figure 75).

Figure 75: Connect Fiber-Optic Cable to a PIC



13. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop, using the cable management system.

> **Caution** Never let cables hang free from the connector. Do not allow fastened loops of cable to dangle from the rack, because this stresses the cable at the fastening point.

14. To bring the FPC online, press the FPC online/offline button on the craft interface until the green ON LED lights.

Verify That the FPC Is Installed Correctly

When the FPC is brought online, if the router is operational, the Routing Engine downloads the FPC software, and the FPC runs its diagnostics. You can verify that this process is occurring by checking that the green OK LED above the FPC is blinking as the FPC starts up. When the FPC is online, the OK LED lights steadily.

To check the status of the FPCs and PICs with the CLI, use the following command:

```
user@host> show chassis fpc pic-status fpc-slot
```

For more information about using the CLI to get information about the FPCs and PICs, see the JUNOS Internet software manuals.

Replace a PIC

PICs are hot-insertable and hot-removable. When you remove a PIC, the router continues to function, although the PIC interfaces being removed no longer function. This section discusses the following topics:

Remove a PIC on page 168

Install a Replacement PIC on page 170

Verify That the PIC Is Installed Correctly on page 171

Remove a PIC

The PICs are located in the FPCs installed in the front of the router. A PIC weighs less than 1 lb (0.5 kg).

To remove a PIC, follow this procedure (see Figure 76):

1. Have ready a replacement PIC or PIC blank panel, an antistatic mat, and a rubber safety cap for the PIC transceiver.
2. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.
3. Take the PIC offline by pressing its online/offline button. Press and hold the button until the PIC LED goes out (about 5 seconds). The online/offline button for PICs installed in an FPC1 is located on the FPC faceplate.
4. Label the cables connected to the PIC so that you can later reconnect each cable to the correct PIC.

Do not look directly into the PIC transceiver or into the end of the optical fiber cable. PICs that use SONET or ATM single-mode optical fiber contain laser light sources that can damage your eyes.

5. Remove the cable connector plugged into the PIC and immediately place a rubber safety cap over the PIC transceiver.

6. Carefully drape the disconnected cable over the hooks in the cable management system below the FPC card cage to prevent the cable from developing stress points.

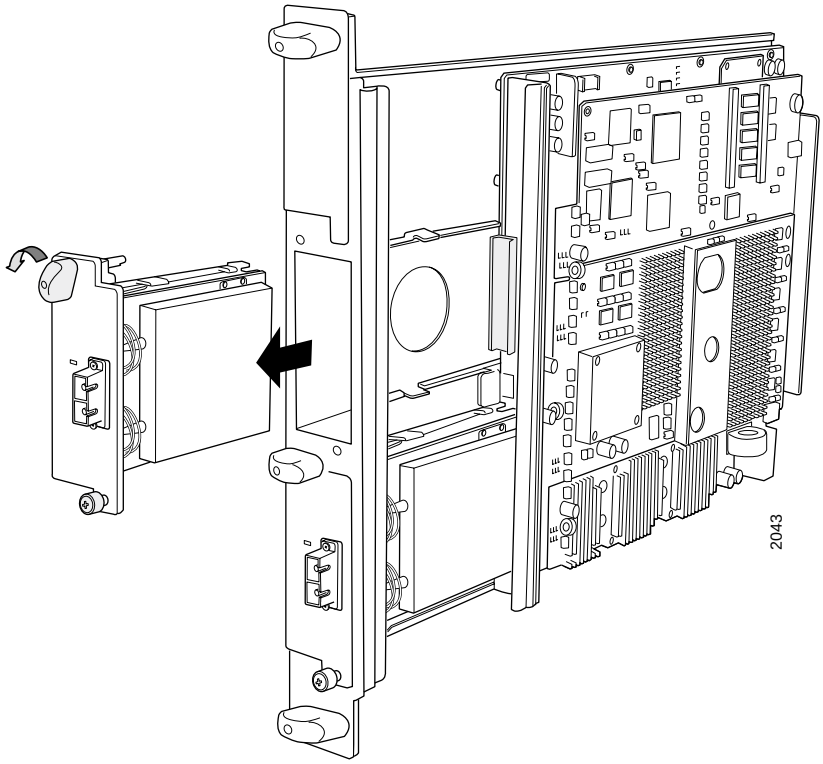
> **Caution** Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

7. For an FPC3 PIC, loosen the captive screw at the bottom of the PIC faceplate, then twist the ejector handle at the top of the faceplate counterclockwise to unseat the PIC. For an FPC1 or FPC2 PIC, loosen the captive screws at the top and bottom of the faceplate.

8. Slide the PIC out of the FPC.

9. Place the removed PIC on an antistatic mat or in an electrostatic bag.

Figure 76: Remove a PIC



Install a Replacement PIC

To install a replacement PIC, follow this procedure (see Figure 77):

1. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.

2. Take the replacement PIC out of its electrostatic bag and place it on an antistatic mat.

3. Each PIC with a fiber-optic interface should have a rubber safety cap covering the PIC transceiver. If it does not, place a safety cap over the transceiver.

4. Slide each PIC into the appropriate slot in the FPC, aligning the notches at the rear connector on the PIC with the notches in the FPC.

> **Caution** Be careful to insert the PIC straight into the FPC to avoid damaging the exposed components on the PIC.

5. For an FPC3 PIC, turn the ejector handle at the top of the PIC faceplate clockwise, then tighten the captive screw at the bottom of the faceplate to secure the PIC in the FPC. For an FPC1 or FPC2 PIC, tighten the captive screws at the top and bottom of the faceplate.

6. Remove the rubber safety cap from the PIC transceiver.

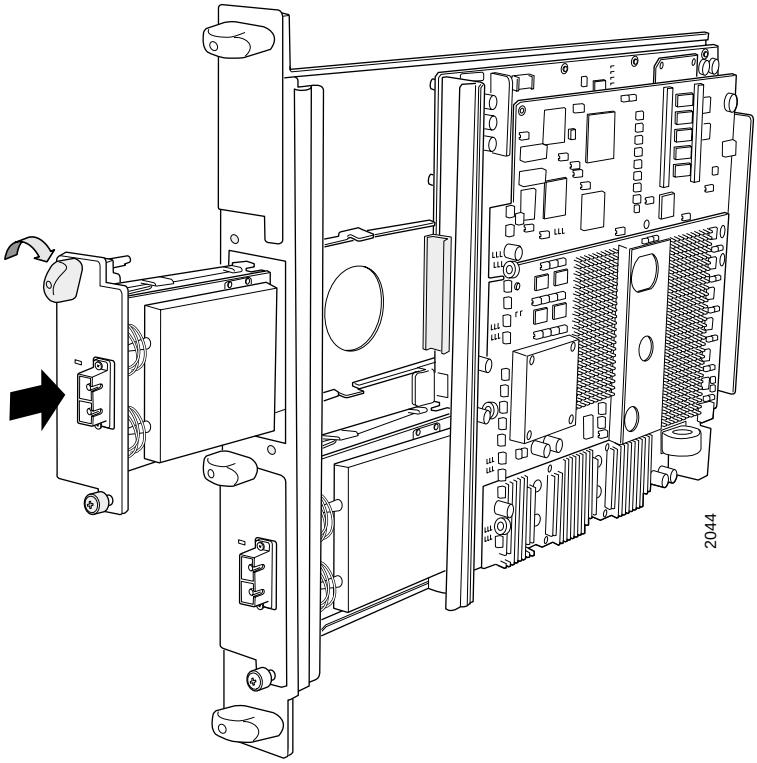
> **Warning** Do not look directly into the PIC transceiver or into the end of the optical fiber cable. PICs that use SONET or ATM single-mode optical fiber contain laser light sources that can damage your eyes.

7. Connect the appropriate cable connector to the PIC transceiver.

8. Carefully drape the PIC cable over the bobbins of the cable management system below the FPC card cage to prevent the cables from developing stress points.

9. To bring the PIC online, press the PIC offline/online button until the PIC LED lights green. The online/offline button for PICs installed in an FPC1 is located on the FPC faceplate.

Figure 77: Install a Replacement PIC



Verify That the PIC Is Installed Correctly

You can check the status of the PICs by observing the status LED on the PIC faceplate. Each LED has four different states. For more information about the PIC LEDs, see the *T320 Internet Router PIC Guide* .

To check the status of the PICs with the CLI, use the following command:

```
user@host> show chassis fpc pic-status fpc-slot
```

For more information about using the CLI to get information about the PICs, see the JUNOS Internet software manuals.

Replace an SFP

Small form factor pluggables (SFPs) are used in the 10-port Gigabit Ethernet PIC. Up to ten SFPs can be installed in a single PIC. The slots are numbered 0 to 9, left to right and top to bottom. For more information about SFPs, see the *T320 Internet R outer PIC Guide* .

SFPs are hot-insertable and hot-removable. When you remove an SFP, the PIC continues to function, although the optical interface being removed no longer functions. This section discusses the following topics:

Remove an SFP

To remove an SFP, follow this procedure (see Figure 78):

1. Have ready a replacement SFP or an SFP slot plug, an antistatic mat, and a rubber safety cap for the SFP transceiver.
2. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.
3. Label the cables connected to the SFP so that you can later reconnect each cable to the correct SFP.

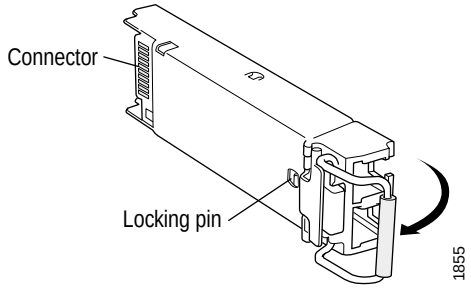
Do not look directly into the PIC transceiver or into the end of the optical fiber cable. PICs that use single-mode optical fiber contain laser light sources that can damage your eyes.

4. Remove the cable connector plugged into the SFP.
5. Carefully drape the disconnected cable over the hooks in the cable management system below the FPC card cage to prevent the cable from developing stress points.

Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

6. Pull the ejector handle out from the SFP to unlock the SFP.

Figure 78: Small Form Factor Pluggable (SFP)



7. Place a rubber safety cap over the optical transceiver.

8. Grasp the handle of the SFP and pull the SFP out of the PIC.

9. Place the removed SFP on an antistatic mat or in an electrostatic bag.

Install a Replacement SFP

To install a replacement SFP, follow this procedure (see Figure 78):

1. Attach an ESD wrist strap to your bare wrist, and connect the wrist strap to one of the ESD points on the chassis.

2. Take each SFP to be installed out of its electrostatic bag and identify the slot on the PIC where it will be installed.

3. Verify that each SFP has a rubber safety cap covering the optical transceiver. If it does not, cover the transceiver with a safety cap.

4. Carefully align the SFP with the slots in the PIC. The connectors should face into the PIC. For SFPs installed in the slots on the left side of the PIC, the connector should face to the right. For SFPs installed in the slots on the right side of the PIC, the connector should face to the left.

5. Slide the SFP until the connector is seated in the PIC slot. If you are unable to fully insert the SFP, make sure the connector is facing the proper direction.

6. Remove the rubber safety cap from each fiber-optic transceiver.

> **Warning** Do not look directly into the PIC transceivers on into the ends of the optical fiber cable. PICs that use single-mode optical fiber contain laser light sources that can damage your eyes.

7. Connect the appropriate cable to the SFP transceiver (see Figure 75).

Verify That the SFP Is Installed Correctly

You can check the status of the SFPs by observing the status LEDs on the PIC faceplate. Each port has one LED. For more information about the PIC LEDs, see the *T320 Internet R outer PIC Guide* .

To check the status of the PIC with the CLI, use the following command:

```
user@host> show chassis fpc pic-status fpc-slot
```

For more information about using the CLI to get information about the PICs, see the JUNOS Internet software manuals.